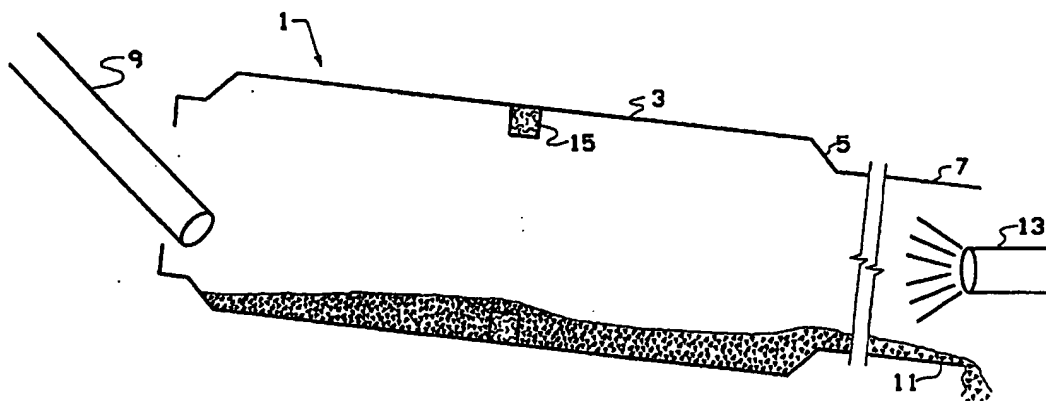




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(54) Title: APPARATUS FOR CALCINING PETROLEUM COKE**(57) Abstract**

A rotary calciner (1) including an elongated shell having a first diameter extending from the discharge end (11) back to a transition zone (5) and a second larger diameter extending from the transition zone (5) back toward the feed end, and including a dam (15) positioned in the larger diameter section (3).

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APPARATUS FOR CALCINING PETROLEUM COKE

Background of the Invention

1. Field of the Invention

5 This invention relates to calcining kilns of the type comprising an elongated rotating shell mounted at a slight angle to the horizontal with the feed end elevated relative to the discharge end, and more particularly to rotary calciners for calcining green
10 petroleum coke.

 Petroleum coke calciners have numerous design criteria. First, they must be capable of properly calcining a design volume of feed. A further design
15 criterion is that fines entrainment in the calciner flue gas must be controlled so that flue gas treatment equipment is not overloaded and yield loss is not excessive. Flue gas treatment equipment typically includes some combination of units such as settling
20 chambers, incinerators, boilers, cyclones, electrostatic precipitators, scrubbers, baghouses, and exhaust gas stacks.

2. Background Art

 Petroleum coke calcining is a well-developed art in which green coke is heated in a kiln to drive off
25 moisture and volatile organic matter. Various calcining conditions, well understood by those skilled in the art, are utilized to provide a calcined coke product having particular properties depending on the intended end use of calcined product. A thorough discussion of coke
30 calcining appears in U.S. Patent No. 4,022,569 to Farago et al. A discussion of coke calcining is also found in U.S. Patent No. 4,053,365 to Welter. U.S. Patent No. 5,007,987 suggests heating coke at a slow heat-up rate between the range of 875 and 1200°F. prior to heating the
35 coke to a higher calcining temperature.

 Depending on the end use to which the calcined coke is to be put, there are many properties of calcined

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coke that are of concern to the user. Some of these properties are vibrated bulk density, grain strength, particle size distribution, friability, porosity, etc. The values for some of these properties can be enhanced by controlling the calcining operation to provide that the coke is heated slowly through a selected temperature range such as from 800 to 1400°F.

Summary of the Invention

In accordance with the present invention, a rotary calcining kiln is provided with a large diameter section extending from a transition zone back toward the feed end and a smaller diameter section extending from the transition zone to the discharge end, and includes at least one ring-shaped dam on the interior of the large diameter section.

The Drawings

The Figure is a schematic representation of a rotary calciner showing the features of the invention.

Description of the Preferred Embodiments

Flow of coke through the calciner can be slowed by having an increased shell diameter from a transition zone back toward the feed end. However, the coke may not back up the full length of the larger diameter section, with the result that a "void" zone could be created. Heat-up rate in the void zone would be undesirably high. Installation of at least one dam in the larger diameter section eliminates or reduces the void zone and maximizes the benefits of the larger diameter section. By sizing the dam or dams to have an opening at least as large as the smaller diameter section of the kiln, entrainment problems that result from use of dams in a constant diameter shell are eliminated or at least minimized.

In the present invention, as illustrated in the Figure, a calciner is shown generally at 1. Calciner 1

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has a large diameter section 3 extending from the feed end to a transition zone 5, and a smaller diameter section 7 extending from transition zone 5 to discharge end 11. A feed spout 9 in the feed end and a burner 13 in the discharge end are shown. Conventional ancillary flue gas equipment is not shown, nor is a supplemental air supply means shown, although these items would normally be included in the overall unit.

A dam 15 located in the larger diameter section eliminates or minimizes the void zone in the larger diameter section. In some cases, more than one dam may be provided in the larger diameter section. An alternative to the illustrated embodiment would utilize a first dam and a second dam downstream of the first dam, the second dam being smaller (larger opening) than the first dam. The number, size and position of the dam or dams in the large diameter section can be selected to provide a desired heat-up rate for a particular set of operating variables, it being essential in accordance with the invention that at least one dam be located in the large diameter section.

Most Preferred Embodiment

The following description is intended to define a calciner according to the invention that could be utilized to calcine coke to produce a calcined product having improved properties compared to those that would be obtained in a conventional calciner operating at a comparable feed rate. An example of a preferred calciner in accordance with this invention has an overall length of 230 feet, a transition zone about 100 feet from the feed end, a large diameter section extending from the transition zone back about 90 feet toward the feed end, and a small diameter section extending from the transition zone to the discharge end. The internal diameter of the large diameter section is 15 feet, and the internal diameter of the small diameter section is

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10.5 feet. A dam is located about 40 feet from the feed end, and extends 2.25 feet into the larger diameter section. Such a calciner can provide a high quality product at a reasonably high feed rate while still maintaining an acceptable level of fines entrainment. Feed rate, burner operation, air supply rate, and calciner RPM can be adjusted to provide the desired low heat-up rate of coke through a selected temperature range such as 800-1400°F. A reduced heat-up rate is desired, and the lowest heat-up rate through the selected range consistent with desired throughput, is preferred.

In the preferred calciner as described above, the opening through the dam is as large as the inner diameter of the smaller diameter section of the kiln, so it does not produce major entrainment problems such as would result from a dam in a uniform diameter kiln.

Calcined coke quality is measured by many factors, and use of a calciner in accordance with this invention provides the means to control these factors to a degree greater than can be done with conventional calciners.

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We claim:

Claim 1. In a petroleum coke rotary calcining kiln comprising an elongated rotating shell mounted at a slight angle to the horizontal with a feed end at the higher end thereof and burner means near the lower discharge end thereof, the improvement wherein:

(a) said shell has a first diameter extending from said discharge end back to a transition zone, and a second larger diameter extending back from said transition zone toward said feed end; and

(b) at least one dam means is located in the larger diameter section of said shell.

Claim 2. A calcining kiln in accordance with Claim 1 wherein said dam means is a single dam.

Claim 3. A calcining kiln in accordance with Claim 2 wherein the opening through said dam is at least as great as the inner diameter of said first diameter of said shell.

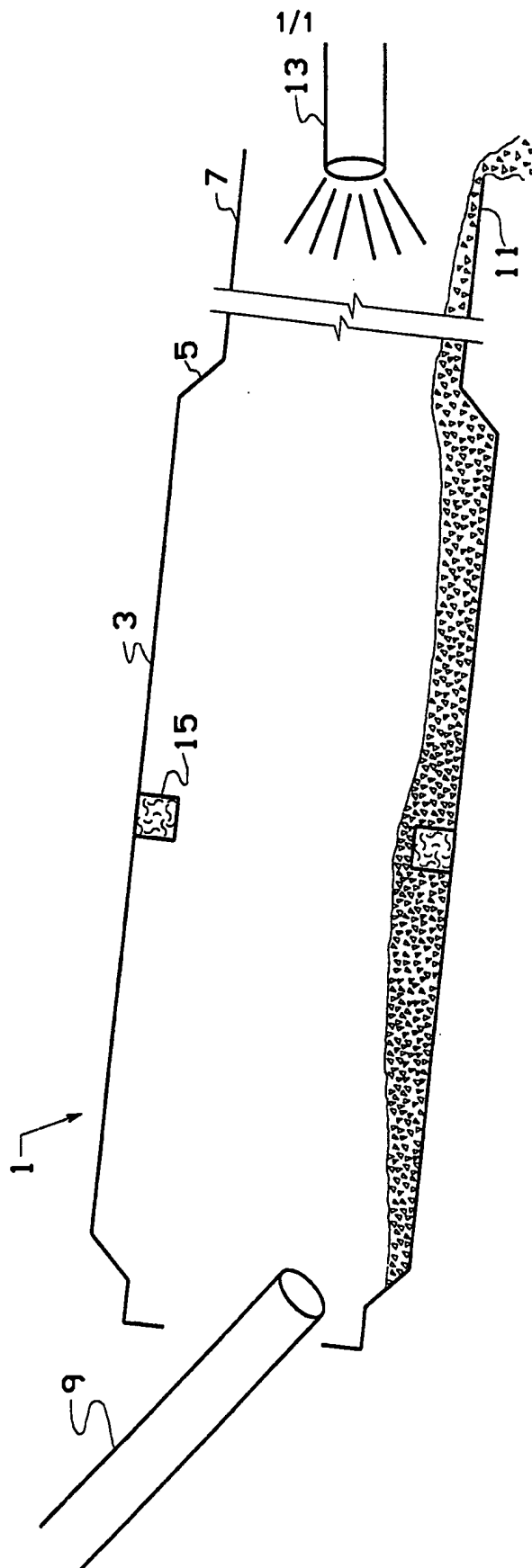
Claim 4. A calcining kiln in accordance with Claim 3 wherein a second dam means having an opening greater than the opening through said first dam is located in the larger diameter section of said shell.

Claim 5. In a petroleum coke calcining process wherein green petroleum coke is heated to calcining temperature in a rotary calciner having a first diameter section extending from a transition zone toward the discharge end and a second larger diameter section extending from said transition zone back toward the feed end, and wherein at least one dam means is located in said second section, the improvement wherein said kiln is operated to provide a reduced coke heat-up rate through the range of 800-1400°F.

Claim 6. A process as described in Claim 5 wherein the calcining kiln opening through said dam is at least as great as the inner diameter of said first diameter section.

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Claim 7. A process as described in Claim 6 wherein a second dam having an opening greater than the opening through said first dam is located in the larger diameter portion of said shell.



INTERNATIONAL SEARCH REPORT

International application No.

PCT/US96/02917

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :F27D 7/00

US CL :432/110

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 432/110,105,108, 111, 103,14,17,115

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, A, 4,880,379 (CHAMPONNOIS) 14 November 1989, see abstract.	1-7
Y	US, A, 4,859,177 (KREISBERG ET AL) 22 August 1989, see col. 3, lines 32-40.	1-7
Y	US, A, 4,022,569 (FARAGO ET AL) 10 May 1977, see abstract.	1-7
A	US, A, 1,914,462 (RONNE) 20 June 1933, see entire document.	1-7

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	*T*	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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